CALIFORNIA PUBLIC UTILITIES COMMISSION

*Rail Safety and Carriers Division*

# Grade Separation Priority List Index Formula revision Workshop report

***March 2001***

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## Executive Summary

As ordered by Public Utilities Commission (Commission) Decision 00-08-020, dated August 3, 2000, staff convened a workshop and subsequent committee meeting to discuss the proposals presented in Order Instituting Investigation (OII.) 99-07-001 and to revise the formulas by which the Commission ranks projects for the Grade Separation Priority List. Staff was directed to notify all interested parties sixty days in advance to the commencement of the workshop. Commission staff was also directed to submit a workshop report and make its recommendations to the Commission prior to the OII in the next Grade Separation Program proceeding. The next OII is tentatively scheduled to begin early June 2001. Taking into consideration the consensus and interests of participating parties, this document affirms staff's recommendation on a proposed revised priority index formula.

Staff established a procedure to afford parties an opportunity to raise issues regarding the revisions of the formulas throughout the process. The workshop held on December 6, 2000 in San Francisco, covered comments and suggestions from twenty-one participants representing local agencies, railroad companies, light rail agencies and interested parties. The purpose of the workshop was to reach a consensus on the issues of the Grade Separation Priority List Formula (GSPLF). In case a consensus could not be reached on certain issues, it was agreed to form a committee, made up of five to seven members that would attempt to resolve these issues.

On January 16, 2001, the committee meeting was held in the Los Angeles office to discuss the remaining issues. Eight participants attended the committee meeting. The Committee's goal was to reach a consensus on the unresolved issues from the workshop. The five major unresolved GSPLF issues included the cost factor, blocking delay, accident history, special condition factors and light rail train count. Based on the consensus reached at the workshop and subsequent meeting, staff has made revisions to the grade separation formula index. A summary of the committee meeting stating the terms of consensus, also listing opposing party opinions is included in the report and was sent electronically to those interested parties.

Staff received additional comments to the consensus reached index formula. After careful analysis, staff believes these additional comments and opinions submitted to the revised formulas do not merit additional changes (see Appendix B). For fiscal year 2002-2003 and 2003-2004, Staff recommends that the following revisions to the GSPLF, hereinafter called "proposed formula," be adopted for the next proceeding.

**Proposed Formula - Crossings Nominated For Separation Or Elimination**

$$P = \frac{V * (T + 0.1LRT) * (AH + 1)}{C} + SCF$$

Where:

- **P** - Priority Index Number
- **V** - Average 24-Hour Vehicular Volume (1 point per vehicle)
- **C** - Cost Allocated by Grade Separation Fund (1 point per thousand dollars)
- **T** - Average 24-Hour Train Volume (1 point per train)
- **LRT** - Average 24-Hour Light-Rail Train Volume (1 point per train)
- **AH** - Accident History (up to 3 points per accident)
- **SCF** - Special Conditions Factor = BD+VS+RS+CG+PT+OF (up to 58 points)
  - **BD** - Crossing Blocking Delay (up to 5 points)
  - **VS** - Vehicular Speed Limit (up to 5 points)
  - **RS** - Railroad Prevailing Maximum Speed (up to 7 points)
  - **CG** - Crossing Geometrics (up to 17 points)
  - **PT** - Passenger Trains (up to 10 points)
  - **OF** - Other Factors: passenger buses, school buses, trains carrying hazardous materials trains and trucks, and community impact (up to 14 points)

**Summary of Changes:**

**C = Cost Allocated by Grade Separation Fund**

The cost C is adjusted to be the state allocation or the amount needed to fund the project by each nominating party. Up to a maximum of five million dollars per project will be allocated, unless the applicant is seeking multiple-year funding as applicable in S&H Code § 2454(h) with the California Transportation Commission making the multi-year funding qualification.

**F = Inflation factor** (calculated to be 8.32) eliminated, since the program amount has not kept up with inflation and remains at $15 million, unaltered from its inception.

**SCF = BD+VS+RS+CG+PT+OF (up to 58 points).** Blocking Delay (BD) is per train, during a 24-hour period, the total time vehicular traffic is delayed to allow a train to pass at a crossing. BD, for a typical day, is the elapse time in minutes when trains pass the crossing. The delay is measured from the point that the warning devices are activated at the crossing and the time after the train has cleared the crossing and the warning devices are reset. The BD points will be assigned a value in a range from 0 to 5 points based on the total delay time. The other factor (OF) was reduced from 18 points to 14 points by eliminating secondary accidents (-3 points) and emergency vehicle usage (-3 points) then increasing community impact (+2 points). With the elimination of alternate route (AR, -5 points) plus the addition

of blocking delay (BD, +5 points), the total for SCF is reduced from a maximum possible of 62 points to 58 points.

**Proposed Formula - Existing Separations Nominated For Alteration or Reconstruction**

$$P = \frac{V * (T + 0.1LRT)}{C} + SF$$

Where:
- **P** - Priority Index Number
- **V** - Average 24-Hour Vehicular Volume (1 point per vehicle)
- **T** - Average 24-Hour Train Volume (1 point per train)
- **LRT** - Average 24-Hour Light Rail Train Volume (1 point per train)
- **C** - Cost Allocated by Grade Separation Fund (1 point per thousand dollars)
- **SF** - Separation Factor = WC + HC + SR + AS + POF + AP + DE
  - **WC** - Width Clearance (up to 10 points)
  - **HC** - Height Clearance (up to 10 points)
  - **SR** - Speed Reduction (up to 5 points)
  - **AS** - Accidents at or near structure (0.1 pt per accident)
  - **POF** - Probability of Failure (up to 10 points)
  - **AP** - Accident Potential (up to 10 points)
  - **DE** - Delay Effects (up to 10 points)

**Summary of Changes:**

**C = Cost Allocated** by Grade Separation Fund

The cost C is adjusted to be the state allocation or the amount needed to fund the project by each nominating party. Up to a maximum of five million dollars per project will be allocated, unless the applicant is seeking multiple-year funding as applicable in S&H Code § 2454(h) with the California Transportation Commission making the multi-year funding qualification.

**F = Inflation factor** (calculated to be 8.32) eliminated, since the program amount has not kept up with inflation and remains at $15 million, unaltered from its inception.

## Background of the Grade Separation Program

Section 2450 et seq. of the California Streets and Highways (S&H) Code establishes the Grade Separation Program to fund projects throughout the state that will eliminate hazardous grade crossings. Each year, the California Transportation Commission (CTC) distributes a total of $15 million to eligible projects (S&H Code Section 190) in the priority list established by this Commission. Therefore, prior to July 1 of each year, the Commission establishes a Priority List of eligible separation projects throughout the state most urgently in need of construction or reconstruction pursuant to S&H Code Section 2452.

The Commission's priority list may contain projects for the construction of existing and proposed crossings at grade in need of separation, alteration or reconstruction of existing separations, or projects that eliminate grade crossings by removal or relocating streets or railroad tracks. The priority list, based on criteria established by the Commission, includes projects on city streets, county roads, and state highways, which are not freeways as defined in S&H Code Section 257.

For a project that eliminates an existing crossing or alters or reconstructs an existing grade separation, an allocation of 80% of the estimated cost of the project is made, with the local agency and railroad each contributing 10%. For a project that plans a grade separation of a proposed new crossing (where currently there is no existing crossing), an allocation of 50% of the estimated project costs is made, with the remaining 50% contributed by the local agency. In compliance with S&H Code Section 2454(g), the total allocation for a single project shall not exceed $5 million without specific legislative authorization. The California Transportation Commission allocates funds based upon the Commission's adopted priority list and the requirements set forth in S&H Code § 2454.

### Existing Priority Formula

The criteria for ranking projects to determine priority are left to the discretion of the Commission (S&H Code § 2452). The criteria have been continually refined in previous proceedings. The principal method adopted by the Commission to determine project priority is a formula which weighs vehicular and train traffic volumes (V*T) at a project location along with project costs (C*F), and which also measures a variety of special condition factors (SCF) at the nominated site. Different SCF were developed for the elimination and separation of grade crossings than for the alteration or reconstruction of grade separations. Application of the formula to data for a particular project results in the assignment of points for factors occurring at the project location. The points form the basis for a rank on the priority list.

Secondary criteria are used to rank projects, which obtain the same number of points. In such cases, based upon the intent to eliminate hazardous grade crossings, priority is given to projects, which eliminate or separate existing grade crossings, then to projects to alter or reconstruct existing grade separations, and last to projects to construct new grade separations.

The objective of the Grade Separation Program is to improve safety and reduce traffic congestion and motorist delays at the crossings. Therefore, the current formula reflects the intent of the grade separation program by giving greater weight to accident history and blocking delay. Decision D.90-06-058 provided the details of the existing Grade Separation Priority List formula.

Current Formula - Crossings Nominated for Separation or Elimination:

$$P = \frac{V * (T + 0.1LRT) * (AH + BD)}{C * F} + SCF$$

Where SCF =VS+RS+CG+AR+PT+OF

Current Formula - Existing Separations Nominated for Alteration or Reconstruction:

$$P = \frac{V * (T + 0.1LRT)}{C * F} + SF$$

Where SF=WC+HC+SR+AS+POF+AP+DE

## Public Utilities Commission Decision 00-08-020

Commission Decision (D.) 00-08-020, dated August 3, 2000, ordered staff to convene a workshop to discuss the proposals presented in Order Instituting Investigation (OII.) 99-07-001 to revise the Grade Separation Priority List Index formulas by which the Commission ranks projects. The workshop was held on December 16, 2000 in San Francisco. All attending parties (see Appendix A) agreed to form a representative committee to resolve further issues.

On January 16, 2001, the committee met in Los Angeles to discuss the remaining issues (see **Committee Meeting** section). Staff established a procedure to afford parties an opportunity to raise issues regarding the revisions of the formulas throughout the process.

The decision to revise the index formulas came as a result of the September 21, 1999 Pre-Hearing Conference. Mr. Barton, an interested party, filed comments in OII.99-07-001 recommending revisions to the current Grade Separation Priority List Formula as follows:

$$P = \frac{V \times (T + 0.1LRT)}{C \times F} + AH + BD + SCF + SofR$$

In Mr. Barton's opinion, accident history and blocking delay should be treated like another special condition factor. Since, accidents occur randomly, there is too much emphasis on recent accident history on the current grade separation formula. The blocking delay does not recognize the increased hazards caused by short trains. He stated that the calculation of the blocking delay should be the total number of minutes of delay per day divided by an arbitrary constant such as 10 than by the number of train movements.

The state of readiness also should be added in order to recognize prior investments made by local agencies in engineering work and right-of way acquisition and maintain continuity in the process. Finally the maximum number of points under the special conditions factor such as crossing geometrics, number of school buses, etc. should be increased from 17 to 20 to account for judgement of the Commission's engineering field staff.

Mr. Barton also recommends a different formula for existing separations nominated for alteration or reconstruction:

$$P = \frac{V \times Const}{C \times F} + AH + BD + SCF + SofR$$

The (T+0.1LRT) term in the above formula should be replaced with a uniform constant (*Const*) so the formula could accurately identify those separations most urgently in need of

alteration or reconstruction. The only difference between the two formulas is the elimination of the number of train factor (T+0.1LRT). The reason is that the vehicle and train grade crossing conflicts disappear when an existing grade separation is in place. This constant should reflect the hazards of an existing grade separation such as constricted or narrow roadways between supporting columns, substandard vertical clearance, structural inadequacy and dangerous sharp approaches.

Other interested parties, H. Richard Neill of Moffatt & Nichol Engineers, Erwin Ohannesian from Fresno County Public Works Department, O. Gary Plunkett from Tehama County Public Works and Rick Raives from the City of San Buenaventura, agreed with Barton that the existing formula needs revision and requested that a workshop should be held for formula revisions. The administrative law judge agreed, and ordered Staff in (D.) 00-08-020, dated August 3, 2000, to hold a workshop.

## Workshop

Staff convened a workshop on December 6, 2000 in San Francisco as ordered by D.00-08-020. The purpose of the workshop was to come to a consensus on how to improve the Grade Separation Priority List Index Formula. The workshop covered comments and suggestions from twenty-one participants representing local agencies, light rail agencies, railroad companies, and interested parties. It was agreed by participating parties that if a consensus could not be reached on an issue, a committee made up of five to seven members would be formed to resolve these issues.

Staff contacted all cities, counties, and interested parties by mail of the pending workshop sixty days prior and solicited comments to be incorporated in the process for issues for discussion. The staff also developed a website, accessible through the official Commission Internet site, explaining the process, listing received comments, giving background on the program, listing staff contacts and citing relevant information.

**Procedural Matter**

Prior to the workshop, interested parties were able to retrieve Grade Separation Priority index formula information on the established Commission website. Participants were encouraged to give input during the workshop. A brief overview of the workshop process was as follows:

1. Issue introduction- Light rail train count, cost factor, state of readiness, blocking delay, accident history and special condition factor are the six major issues that were discussed upon the review of the written comments received by November 3, 2000.
2. Open Forum for Discussion- Participants were given an opportunity to raise concerns on each issue. All interested parties became familiar with problems faced by others in the workshop and worked to solve them.
3. Group Consensus- If a consensus cannot be reached, the committee will be formed to resolve the issues.

The comments for the workshop are attached in Appendix A. Part of the handouts included a Microsoft Excel worksheet summarizing the proposed six alternative formulas by the interested parties and staff. Each sheet presents the proposed alternative ranking with the existing index formula ranking. Two of the alternatives were variations of the current index formula. One formula eliminated both the cost and the inflation factor in the denominator. The other proposed formula changed the accident history from a ten-year period to a five-year time frame. Mr. Barton proposed an index formula with various changes including moving the accident history as an additive, dividing the blocking delay by ten (10), adding an engineering judgement factor with a maximum value of 17 to 20 points in the special

condition factors, and adding a state of readiness factor with varying values awarded depending on the degree of readiness. These are not based on any engineering study, but are recommended based on "common sense."

The next two set of proposals are based on adopting the United States Department of Transportation (USDOT) formula. The first would keep the recommended five-year accident history, the second a ten-year accident history. The USDOT formula puts significant weight on accident predictability. A lot of analysis is figured in the formula, taking into account: current warning devices, train speed, train through the day, switching trains, urban/rural crossing, exposure index (vehicles*trains), tracks, paved highway (yes/no), highway type, highway lanes, and historical accidents in (N) number of years. The last proposal considered was GradeDec2000, an investment decision support tool allowing decision makers to prioritize highway-rail grade crossing investments based upon an array of benefit-cost measures. This software tool is being developed by the Federal Railroad Administration and is currently available in an updated version.

The following is a summary of the main issues for the workshop.

**Light Rail Transit Issues**

Among the light rail issues brought up is whether exclusive light is eligible for funding under the grade separation formula. Several light rail representatives brought out the issue of possible revision to the Decision 90-06-058 ruling. The Staff stated that only a Commission decision could change the Decision 90-06-058 ruling to include exclusive light rail train crossing projects in the grade separation formula.

A suggestion to increase funding for the grade separation program was mentioned in order to accommodate both heavy rail and light rail trains. As Staff pointed out, the issue of funding and the intent of the program could only be resolved by the State of Californian legislature. The issue of light rail train counts was mentioned, specifically how it is to be valued in the formula. The braking characteristic of heavy rail vs. light rail was discussed. While light rail braking was deemed to be more efficient, light rail accidents are higher on a per crossing basis. Frequency and traffic and rail volume are considered to be the two most important factors in terms of safety at the crossing according to some light rail representatives.

The committee will resolve this issue. The general consensus for the light rail issues was to determine whether to:

1. Leave the 0.1 light rail train factor as it is
2. Eliminate the 0.1 light rail train factor completely
3. Develop different formulas for light rails, heavy rails and both light & heavy rails.

**Cost Factor**

Costs for grade separations vary by the type of project, location and many other factors. Participants agreed light-rail costs are sometimes much higher than heavy rail project costs. For OII.99-07-001, the average grade separation cost about $20 million. But in some rural and remote areas, the cost for a grade separation is about $5 million.

The committee will resolve this issue. The general consensus for the cost factor is to

1. Leave the cost factor as it is
2. Eliminate cost factor completely
3. Put the state allocation or the partial amount needed to fund the grade separation project by each nominating party for the cost factor.

**State of Readiness**

Mr. Bob Barton, an interested party stated that a state of readiness should be recognized as an important factor. The general consensus is not to include the state of readiness to the grade separation formula.

**Blocking Delay**

The participants agreed to keep blocking delay on the priority list formula and discussed the different methods in calculating this factor. Staff suggested that blocking delay could be calculated as level of service under the California Highway Capacity Manual. It was also suggested that blocking delay could be calculated on 24 hour and a per train basis.

The committee will resolve this issue. The general consensus for the cost blocking delay is remedy the:

1. Placement in the formula as a multiplier or additive
2. Computation (Per train basis? Level of service? 24 hour basis?)

**Accident History**

The participants decided to retain accident history on the grade separation formula. The debate over accident history is whether its calculation should be based on the number of accidents or the severity of the accidents. The question on severity of accidents is whether points should be awarded to injuries and fatalities. The length of accident history was also discussed. Possibilities include five-year or ten-year history or date from which the crossing's latest warning devices were installed.

The committee will resolve this issue. The general consensus for the accident history is to determine:

1. Placement in the formula as a multiplier or additive
2. Computation (Counting accidents vs. casualties)

**Special Conditions Factors**

Participants expressed concerns that some special condition factors such as secondary accidents and alternate route availability were vague and difficult information to gather. Analyzing a ten year accident history at public at-grade crossings from 1990-1999, staff observed that the lower railroad and vehicular speeds are responsible for the majority of the accidents at the crossings. Therefore, more points should be awarded to lower railroad and vehicular speed.

The committee will resolve this issue. The general consensus for the special condition factors is to decide whether to:

1. Change the points awarded to maximum railroad speed, vehicular speed limit and other factors such as hazardous material trains and trucks
2. Eliminate some of special condition factors such as secondary accidents and alternate route availability

**Other Factors**

Mr. Barton suggested that train count should be eliminated from the index formula for the existing separations nominated for alteration or reconstruction. Mr. Barton wanted Staff to come up with a factor for the existing grade separation to compete equally with the priority list formula for an at-grade crossing separation by awarding them more points. It was agreed to leave the existing grade separation priority index formula alone.

**Closing Remarks**

Participants were requested to give Staff their Internet address, since all future correspondence and distribution of information would be primarily through electronic mail.

The committee members were made up of the following representatives:

Kit Bagnell, LA Co. Dept. of Public Works-Counties
Bob Barton, Private Consultant-Consultants/Local Govt
Ron Mathieu, Metrolink-Commuter Rail
Linda Meadow, Private Consultant-Light Rail
Tom Glover-California Department of Transportation (Caltrans)
Richard Gonzales, Union Pacific-Freight Railroads

## Committee Meeting

Workshop participants agreed to form a committee to resolve any further issues. On Tuesday, January 16, 2001, the committee met at the Los Angeles Commission office. Eight participants attended the meeting. Two members were not able to attend, Tom Glover of Caltrans and Richard Gonzales of Union Pacific, representing heavy-rail interests. Vijay Khawani replaced Linda Meadow, representing light rail transit. Four interested parties also attended the committee meeting. Participants consisted of Commission staff and the following representatives (see Appendix C for listing):

- Kit Bagnell –Counties, committee member
- Bob Barton-Consultants/Local Govt, committee member
- Ron Mathieu-Commuter Rail, committee member
- Vijay Khawani –Rail Transit, committee member substituted for Linda Meadow
- Jeff Cutherell- Greater Bakersfield Separation of Grade District, interested party
- Ron Ruettgers- GBSOGD, interested party
- Carlos Montes de Oca- LACTMA, interested party
- Michelle E. Smith- LACTMA, interested party

The Committee's goal was to reach a consensus on the major issues that were unresolved from the December 6, 2000 workshop held in San Francisco. The five major issues included the cost factor, blocking delay, accident history, special conditions factors and light rail train count.

Participants were given an opportunity to raise concerns on each issue and were encouraged to work together to resolve them.

**The Committee Agenda Summary:**
The following are the main issues with consensus and disagreement opinions.

**Cost Factor (C)**
Discussions revolved around leaving the cost factor as is, eliminating it completely or only including the $5 million maximum allowed per project or the amount sought by the applicant from the Grade Separation Fund. Commission staff stated the cost factor is a simplified cost-benefit analysis in the priority index formula. The current formula does not take into account other cost-benefit factors such as travel time savings, environmental benefits, or safety benefits. The average cost of a grade separation in the last proceeding was about $20 million. Therefore, the $15 million grade separation program cannot fund the 80% allocation per project as originally intended in S&H Code 2454. The cost-benefit analysis should be the burden of the nominating agency, since funds are limited to a maximum of $5 million per

project. In addition, the analysis staff completed whereby the cost factor and inflation factor was eliminated showed there was very little impact on the rankings of the top ten nominated projects for OII 99-07-001.

Mr. Barton disagreed with any changes on the cost factor. He wanted the cost factor remain the same. He stated that the cost of grade separation projects in rural and remote areas is under $5 million because the right of way is relatively inexpensive. It would be unfair and impossible for the rural and remote communities like Tulare and Redding to compete for grade separation funds.

The committee participants reached the consensus, except Mr. Barton that the state allocation or the partial amount needed to fund the grade separation project by each nominating party should be used for the cost factor.

**Blocking Delay (BD)**

The issues are applying blocking delay as a multiplier or additive, and its computation (per train, 24-hour basis or level of service). Mr. Barton presented an example where the ranking on the priority list did not recognize increased hazards caused by short trains. The total blocking delay for a project with 20 trains, 10 of those short trains have a slightly higher index value than a project with just 10 long blocking trains. But the average blocking delay for 10 trains with no short trains has a higher value than the average blocking delay for 20 trains, with 10 short trains. Mr. Barton proposed that total blocking delay be divided by an arbitrary constant of ten (10) and remain as a multiplier.

The committee arrived at the consensus, except Mr. Barton that the blocking delay should be placed in the formula as an additive in the Special Conditions Factor with the computation as the total 24-hour delay.

**Accident History (AH)**

Debated was the placement of the factor in the formula as a multiplier or additive, computation of points (counting incidents vs. incidents plus casualties), and the time period (5 or 10 year accident history or the period of time after the last major safety improvement). Staff opened the discussion on proposed changes on the calculation of the accident history factor. It was suggested that the length of accident history be changed from a ten-year history to a five-year history or the period of time after the last major safety improvement. Another suggestion was that points awarded to accident history should be based on the number of accidents regardless to the number of fatalities or injuries.

All participants except for Mr. Barton agreed that AH should remain a multiplier. Mr. Barton wanted the factor to be an additive instead of a multiplier.

The committee reached the consensus, except Mr. Barton, to keep as is the current method of accident history factor (AH) calculation in the index formula.

**Special Conditions Factor (SCF)**

The discussion included changing the points awarded to train speed, vehicle speed limit and other factors such as hazardous material trains and trucks, but also to eliminate some of the special condition factors such as secondary accidents and alternate route availability. Participants expressed concern that the special condition factor has a larger impact on the priority index number than the exposure factor of vehicle count times train volume (V*T).

The committee agreed to increase the points from three points to five points awarded to community impact and eliminate some of the special conditions factors such as secondary accidents, emergency vehicle usage and alternate route (AR) availability. Secondary accidents and alternate route (AR) availability were vague and difficult information to gather. The community impact already accounts for the emergency vehicle usage. The other factor (OF) was reduced from 18 points to 14 points by eliminating secondary accidents (-3 points) and emergency vehicle usage (-3 points) then increasing community impact (+2 points). With the elimination of AR (-5 points) plus the addition of BD (+5 points), the total for SCF is reduced from a maximum possible of 62 points to 58 points.

**Light-Rail Transit (LRT)**

This issue was left to the end of meeting discussion, as it was to be the most contentious. Participants discussed leaving the 0.1 light-rail train volume multiplier as it is, eliminating the 0.1 multiplier completely, or developing separate formulas for light-rail and heavy rail applicants. No supporting documentation was submitted to change the current light rail factor treatment.

Vijay Khawani stated that the 0.1 multiplier was an arbitrary number and does not fairly reflect the impact of light-rail trains at shared right-of-way crossings, especially with the expanded growth in the last ten years since the acceptance of the index formula.

Staff reminded the committee members that exclusive light-rail train projects were discussed in detail in previous proceedings and there was no need to revisit the issue. It was agreed that the light rail train volume count would be revisited if the funding for the grade separation program were increased. The committee agreed to leave the 0.1 light-rail train volume multiplier as is, except Mr. Khawani.

**Formula for Existing Separations**

Mr. Bob Barton brought up the issue at the meeting, as well as at the workshop to revise the second formula for existing separations nominated for alteration or reconstruction. No other

participants showed an interest in this issue. In conclusion, Committee participants agreed, except Mr. Barton, to leave the formula for existing separations as is.

**Conclusion**

It was requested that comments be submitted by electronic mail to staff member Rosa Muñoz by **Friday, February 9, 2001**. All written comments to the committee's consensus items were summarized by Thursday, February 15, 2001 and are documented in Appendix B.

## Proposed Priority List Index Formulas

Based on the consensus reached at the workshop and subsequent committee meeting, the staff has developed a revised priority index formula. Therefore, for the purpose of determining the priority lists for fiscal year 2002-2003 and 2003-2004, Staff recommends that the Commission adopt the proposed formulas for the next proceeding.

For multiple crossing project evaluation, Staff will evaluate them in the same manner as single crossing projects. Point allocation for multiple crossing projects are determined by adding the vehicle volume, averaging the special condition factors except other factors which are totaled, summing accident history (AH), and averaging the blocking delay of each crossing.

Staff applied the proposed formulas to the projects nominated during the previous proceeding, I.99-07-001 and is found in the next section. Staff made the assumption that the nominating parties would request the maximum fund allocation of five million per project. So the cost factor (C) was set at maximum of five million, unless a lesser amount was requested. The old priority ranking of those projects with higher calculated exposure factors of vehicle volume (V) multiplied by the train volume (T) (V*(T+0.1LRT)) reached higher rankings using the new formula.

**Proposed Formula For Crossing Nominated For Separation Or Elimination**

$$P = \frac{V (T + 0.1 \times LRT) (AH + 1)}{C} + SCF$$

Where:
- **P** - Priority Index Number
- **V** - Average 24-Hour Vehicular Volume (1 point per vehicle)
- **C** - Cost Allocated by Grade Separation Fund (1 point per thousand dollars)
- **T** - Average 24-Hour Train Volume (1 point per train)
- **LRT** - Average 24-Hour Light Rail Train Volume (1 point per train)
- **AH** - Accident History (up to 3 points per accident)
- **SCF** - Special Conditions Factor = BD+VS+RS+CG+PT+OF (up to 58 pts)
  - **BD** - Crossing Blocking Delay (up to 5 points)
  - **VS** - Vehicular Speed Limit (up to 5 points)
  - **RS** - Railroad Prevailing Maximum Speed (up to 7 points)
  - **CG**- Crossing Geometrics (up to 17 points)
  - **PT** - Passenger Trains (up to 10 points)
  - **OF** - Other Factors: passenger buses, school buses, trains carrying hazardous materials trains and trucks, and community impact (up to 14 points)

**C = Cost Allocated by Grade Separation Fund**
The cost C is adjusted to be the state allocation or the amount needed to fund the project by each nominating party. Up to a maximum of five million dollars per project will be allocated, unless the applicant is seeking multiple-year funding as applicable in S&H Code § 2454(h) with the California Transportation Commission making the multi-year funding qualification.

**AH = Accident History** (last 10 years from application filing due date)
Points are awarded as follows for accidents involving trains at crossings with the Crossing Protection Factor (CPF ) based on crossing's warning devices:

Points = (1 + 2 x No. Killed + No. Injured) x CPF

| STANDARD | 9 | 8 | 3 | 1 |
|---|---|---|---|---|
| CPF | 1.0 | 0.4 | 0.2 | 0.1 |

Note 1: No more than three points shall be allowed for each accident prior to modification by the protection factor.

Note 2: Each accident is rated separately and modified by a factor based on the warning devices in existence at time of the accident.

**SCF =** Special Conditions Factor = BD+VS+RS+CG+PT+OF

**BD = Blocking Delay Per Train** (The time in which vehicular traffic is delayed to allow a train to pass at a crossing.) The blocking delay, for a typical day, is the elapse time in minutes when trains pass the crossing. The delay is measured from the point that the warning devices are activated at the crossing and the time after the train has cleared the crossing and the warning devices are reset. The BD points are the total delay time, valued in a range from 0 to 5 points.

**VS = Vehicular Speed Limit - Posted Speed Limit**

| SPEED-MPH | 0-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51+ |
|---|---|---|---|---|---|---|
| POINTS | 0 | 1 | 2 | 3 | 4 | 5 |

**RS = Railroad Maximum Speed**

| SPEED-MPH | 0-25 | 26-35 | 36-45 | 46-55 | 56-65 | 66-75 | 76-85 | 86+ |
|---|---|---|---|---|---|---|---|---|
| POINTS | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**CG = Crossing Geometrics** - 0 - 17 points are awarded to each crossing based on the relative severity of physical conditions, i.e. grade, alignment, site distance, track skew angle, traffic signals, entrances and exits, etc.

**PT = Passenger Trains** – Additional points are given to projects that have passenger trains, including light-rail transit travelling through the crossing based on the following:

| NO. OF TRAINS | 1-2 | 3-5 | 6-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 70+ |
|---|---|---|---|---|---|---|---|---|---|---|
| POINTS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

**OF = Other Factors**- Other Factors are valued in a range from 0 to 14 points based on:

| **CATEGORY** | **POINTS** |
|---|---|
| PASSENGER BUSES | 0-3 |
| HAZ-MAT TRAINS & TRUCKS* | 0-3 |
| COMMUNITY IMPACT | 0-5 |
| SCHOOL BUSES | 0-3 |

* Hazardous Material Trains & Trucks must display the placard with a clearly visible diamond-shaped sign to be counted for this category.

**Proposed Formula For Existing Separations Nominated For Alteration Or Reconstruction**

$$P = \frac{V\,(T + 0.1 \times LRT)}{C} + SF$$

Where:

- **P** - Priority Index Number
- **V** - Average 24-Hour Vehicular Volume (1 point per vehicle)
- **T** - Average 24-Hour Train Volume (1 point per train)
- **LRT** - Average 24-Hour Light Rail Train Volume (1 point per train)
- **C** - Cost Allocated by Grade Separation Fund (1 point per thousand dollars)
- **SF** - Separation Factor = WC + HC + SR + AS + POF + AP + DE
  - **WC** - Width Clearance (up to 10 points)
  - **HC** - Height Clearance (up to 10 points)
  - **SR** - Speed Reduction (up to 5 points)
  - **AS** - Accidents at or near structure (0.1 pt per accident)
  - **POF** - Probability of Failure (up to 10 points)
  - **AP** - Accident Potential (up to 10 points)
  - **DE** - Delay Effects (up to 10 points)

**C = Cost Allocated by Grade Separation Fund**
The cost C is adjusted to be the state allocation or the amount needed to fund the project by each nominating party. Up to a maximum of five million dollars per project will be allocated, unless the applicant is seeking multiple-year funding as applicable in S&H Code § 2454(h) with the California Transportation Commission making the multi-year funding qualification.

**SF** = Separation Factor = WC+HC+SR+AS+PF+AP+DE

**WC** = Width Clearance is determined by bridge width (in feet) and the number of traffic lanes in existence (N):

| If the Width is: | POINTS |
|---|---|
| 16’+12(N) | 0 |
| 12’ but less than 16’ + 12(N) | 2 |
| 8’ but less than 12’ + 12(N) | 4 |
| Less than 8’+12(N) | 6 |
| 11(N) | 8 |
| Less than 11(N) | 10 |

**HC** = Separation Height Clearance is determined by the height clearance from center of traffic lane and bridge (Underpass) or from top of rail and bridge (Overpass).

**Underpass**

| Height (feet) | Points |
|---|---|
| 15' and above | 0 |
| 14' but less than 15' | 4 |
| 13' but less than 14' | 8 |
| Less than 13' | 10 |

**Overpass**

| Height (feet) | Points |
|---|---|
| 22.5' and above | 0 |
| 20' but less than 22.5' | 4 |
| 18' but less than 20' | 8 |
| Less than 18' | 10 |

**SR** = Speed Reduction or Slow Order

| | Points |
|---|---|
| None | 0 |
| Moderate | 2 |
| Severe | 5 |

**AS** = Accidents at or Near Structure during the last 10 years from the application due date. The AS points are determined by dividing the total number of occurrences by 10 and rounded off to the nearest tenth of a point (86 occurrences = 86/10= 8.6 points).

**PF** = Probability of Failure has a 10 point maximum taking structure age into account.

| | Points |
|---|---|
| Minimal/None | 0 |
| Slight | 2-3 |
| Moderate | 4-6 |
| Extreme | 7-10 |

**AP** = Accident Potential – A maximum of 10 points is given for the geometrics at the separation like: road curvature, signage, and illumination.

| | Points |
|---|---|
| None | 0 |
| Slight | 2-3 |
| Moderate | 4-6 |
| Extreme | 7-10 |

**DE** = Delay Effects – A maximum of 10 points is given to conditions that cause traffic delays at the separation like road bottlenecks, slow vehicle usage (trucks, agriculture equipment, lack of left or right turn lanes or other traffic congestion.

| | Points |
|---|---|
| None | 0 |
| Slight | 2-3 |
| Moderate | 4-6 |
| Extreme | 7-10 |

[redacted]

## Table Of OII 99-07-001 Projects With Proposed Formulas Summary:

| AGENCY | CROSSING LOCATION | Vehicle | Trains | Light Rail | New BD | AH | New Cost | New SCF | New Prity # | New Rank | Old Rank | Old Prity # formula |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BAKERSFIELD | HAGEMAN RD | 15126 | 6 | 0.0 | 1 | 0 | 2820 | 11.5 | 45 | 52 | 50 | 21.78 |
| BAKERSFIELD | Q ST | 9252 | 36 | 0.0 | 4 | 3 | 5000 | 21.6 | 292 | 27 | 14 | 68.29 |
| BAKERSFIELD | BEALE-TRUXTON-BAKER (7 Xings) | 19870 | 39 | 0.0 | 5 | 12 | 5000 | 56.4 | 2076 | 3 | 3 | 152.95 |
| BANNING | HARGRAVE ST | 2710 | 36 | 0.0 | 1 | 0 | 5000 | 13.0 | 34 | 54 | 45 | 30.62 |
| BNSF/ALTERNATE | CONSOLIDATION | 6777 | 38 | 0.0 | 2 | 6 | 5000 | 27.7 | 390 | 18 | 11 | 72.48 |
| CAMARILLO | ADOLFO RD | 18019 | 34 | 0.0 | 2 | 1 | 5000 | 18.0 | 265 | 29 | 24 | 55.49 |
| CAMARILLO | LAS POSAS/UPLAND | 18046 | 34 | 0.0 | 2 | 0 | 5000 | 21.0 | 146 | 41 | 30 | 52.16 |
| CHULA VISTA | E ST | 28643 | 2 | 20.6 | 3 | 4 | 5000 | 15.0 | 665 | 14 | 40 | 40.62 |
| CHULA VISTA | H ST | 23546 | 2 | 20.6 | 3 | 0 | 5000 | 16.0 | 125 | 42 | 52 | 20.40 |
| CHULA VISTA | PALOMAR ST | 41480 | 3 | 20.6 | 4 | 0 | 5000 | 15.6 | 215 | 31 | 51 | 21.41 |
| COACHELLA | DILLON RD | 14269 | 36 | 0.0 | 1 | 2 | 5000 | 19.4 | 329 | 26 | 15 | 68.08 |
| CORONA | MCKINLEY ST | 33720 | 51 | 0.0 | 3 | 0 | 5000 | 25.4 | 372 | 21 | 28 | 53.61 |
| DELANO | CECIL AVE | 18000 | 18 | 0.0 | 1 | 4 | 5000 | 17.4 | 342 | 24 | 19 | 61.93 |
| DELANO | GARCES HWY | 9957 | 18 | 0.0 | 1 | 1 | 5000 | 15.4 | 88 | 45 | 43 | 33.34 |
| DOWNEY | BROOKSHIRE AVE | 18766 | 11 | 0.0 | 2 | 0 | 5000 | 14.0 | 57 | 49 | 31 | 51.84 |
| FREMONT | ALT Consolidation | 55756 | 11 | 0.0 | 3 | 0 | 5000 | 40.6 | 166 | 40 | 21 | 57.59 |
| FREMONT | WARREN AVE | 11725 | 49 | 0.0 | 4 | 2 | 5000 | 16.0 | 365 | 22 | 33 | 49.85 |
| FREMONT | CONSOLIDATION | 84598 | 11 | 0.0 | 3 | 0 | 5000 | 96.2 | 331 | 25 | 5 | 126.49 |
| HERCULES | PALM AVE | 5000 | 35 | 0.0 | 0 | 0 | 5000 | 21.0 | 56 | 50 | 49 | 24.12 |
| HERCULES | SYCAMORE AVE | 8218 | 35 |  | 0 | 0 | 5000 | 23.0 | 81 | 46 | 46 | 27.43 |
| IRVINE | SAN CANYON AVE | 22000 | 62 | 0.0 | 2 | 4 | 5000 | 34.0 | 1400 | 5 | 9 | 93.71 |
| KERN COUNTY | OLIVE DR | 17200 | 44 | 0.0 | 3 | 0 | 5000 | 20.6 | 175 | 35 | 25 | 55.13 |
| KERN COUNTY | ROSAMOND BLVD | 13400 | 18 | 0.0 | 5 | 2 | 5000 | 22.3 | 172 | 37 | 34 | 49.40 |
| LATRHOP | LATHROP RD | 10497 | 20 | 0.0 | 2 | 4 | 5000 | 17.0 | 229 | 30 | 27 | 54.29 |
| LATRHOP | LATHROP RD | 10497 | 26 | 0.0 | 2 | 5 | 5000 | 20.0 | 350 | 23 | 16 | 64.34 |
| LOS ANGELES | NORTH MAIN ST | 14188 | 117 | 0.0 | 5 | 1 | 5000 | 39.2 | 708 | 11 | 23 | 56.09 |
| LOS ANGELES | NORTH SPRING ST | 19676 | 117 | 0.0 | 0 | 0 | 5000 | 26.2 | 487 | 17 | 29 | 53.47 |
| LOS ANGELES | VALLEY BLVD | 29203 | 68 | 0.0 | 5 | 9 | 5000 | 24.2 | 4001 | 1 | 6 | 123.38 |
| LOS ANGELES CO | AVENUE S | 21032 | 22 | 0.0 | 1 | 3 | 5000 | 17.8 | 389 | 19 | 44 | 31.29 |
| LOS ANGELES CO | BANDINI BLVD | 28453 | 39 | 0.0 | 2 | 2 | 5000 | 33.0 | 701 | 13 | 22 | 56.18 |
| LOS ANGELES CO | EL SEGUNDO@ WILLOWBROOK | 15332 | 2 | 23.6 | 5 | 0 | 5000 | 22.6 | 106 | 44 | 48 | 26.64 |
| LOS ANGELES CO | FAIRWAY DR | 33205 | 51 | 0.0 | 3 | 3 | 5000 | 23.5 | 1381 | 6 | 7 | 107.43 |
| LOS ANGELES CO | FIRESTONE BLVD | 66310 | 14 | 0.0 | 1 | 0 | 5000 | 17.0 | 204 | 32 | 47 | 27.32 |
| LOS ANGELES CO | FLORES ST | 10850 | 13 | 0.0 | 2 | 0 | 5000 | 6.1 | 36 | 53 | 53 | 13.87 |
| LOS ANGELES CO | NOGALES ST | 43290 | 51 | 0.0 | 3 | 5 | 5000 | 25.3 | 2678 | 2 | 1 | 157.47 |
| LOS ANGELES CO | NORWALK BLVD | 23247 | 110 | 0.0 | 5 | 0 | 5000 | 34.4 | 551 | 15 | 13 | 69.54 |
| LOS ANGELES CO | SIERRA HWY | 12867 | 60 | 0.0 | 1 | 11 | 5000 | 23.7 | 1878 | 4 | 2 | 145.16 |

## Table Of OII 99-07-001 Projects With Revised Formulas – Continued

| AGENCY | CROSSING LOCATION | Vehicle | Trains | Light Rail | New BD | AH | New Cost | New SCF | New Prity # | New Rank | Old Rank | Old Prity # formula |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOS ANGELES CO | SLAUSON AVE | 35021 | 20 | 0.0 | 3 | 0 | 5000 | 23.8 | 167 | 38 | 38 | 42.43 |
| LOS ANGELES CO | TURNBULL CANYON | 22136 | 51 | 0.0 | 5 | 2 | 5000 | 23.6 | 706 | 12 | 17 | 63.45 |
| MONTLCAIR | MONTE VISTA AVE | 12514 | 77 | 0.0 | 5 | 4 | 5000 | 24.0 | 993 | 8 | 4 | 133.46 |
| NAPA VALLEY WINE TRAIN | IMOLA AVE SR 121 | 28200 | 1 | 0.0 | 1 | 0 | 2000 | 5.4 | 21 | 55 | 54 | 13.23 |
| PALMDALE | PALMDALE AVE | 33260 | 60 | 0.0 | 1 | 1 | 5000 | 24.2 | 823 | 9 | 12 | 71.94 |
| REDDING | SOUTH ST | 12405 | 39 | 0.0 | 2 | 0 | 5000 | 18.4 | 117 | 43 | 35 | 47.36 |
| RIVERSIDE | JURUPA AVE | 16190 | 55 | 0.0 | 3 | 5 | 5000 | 37.9 | 1109 | 7 | 8 | 100.85 |
| SAN JOAQUIN CO | WEST LANE | 22873 | 13 | 0.0 | 2 | 5 | 5000 | 16.8 | 376 | 20 | 20 | 58.73 |
| SAN JOAQUIN CO | CONSOLIDATION | 10511 | 38 | 0.0 | 1 | 7.5 | 5000 | 36.3 | 716 | 10 | 10 | 86.91 |
| SAN JOSE | CONSOLIDATION | 6298 | 20 | 0.0 | 1 | 9 | 5000 | 35.2 | 288 | 28 | 18 | 63.02 |
| SCCRA | CENTRAL EXWY | 42236 | 0.29 | 21.0 | 1 | 0 | 5000 | 13.1 | 194 | 33 | 55 | 0.00 |
| SHAFTER | 7TH STANDARD RD | 5300 | 62 | 0.0 | 5 | 1 | 5000 | 23.8 | 160 | 39 | 36 | 47.17 |
| SRTD | FLORIN RD | 37022 | 16 | 0.0 | 1 | 3 | 5000 | 18.0 | 493 | 16 | 32 | 49.98 |
| TEHAMA COUNTY | BOWMAN RD | 5116 | 27 | 0.00 | 1 | 0.00 | 2484 | 22.3 | 79 | 47 | 42 | 36.99 |
| TEHAMA COUNTY | SOUTH AVE | 4970 | 23 | 0.0 | 2 | 0 | 2558 | 21.0 | 68 | 48 | 39 | 40.97 |
| TORRANCE | DEL AMO BLVD | 29000 | 29 | 0.0 | 5 | 0 | 5000 | 9.6 | 183 | 34 | 37 | 42.60 |
| WEST SACRAMENTO | WEST CAPITAL AVE, Permanent | 7848 | 6 | 0.0 | 0 | 0 | 5000 | 38.2 | 48 | 51 | 41 | 39.26 |
| WEST SACRAMENTO | WEST CAPITAL AVE, Emergency repair | 7848 | 6 | 0.0 | 0 | 0 | 350 | 38.2 | 173 | 36 | 26 | 54.37 |

## Appendix A –Workshop Attendees

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## Appendix B - Committee Meeting Attendees & Comment Summary

### Committee Meeting Attendees

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**Summary of Comments Received to Committee Meeting Issues of Consensus:**

**State of California**

## M e m o r a n d u m

**Date:** February 13, 2001

**To:** File

**From:** Public Utilities Commission—Los Angeles - Rosa Muñoz
**File No:**

**Subject:** Grade Separation Priority List Formula Modification Comments Summary

Summarized below is the comments received by the Commission staff regarding the Grade Separation Priority List Formula Modification, resulting from the December 16th, 2000 Committee meeting from the following representatives:

- Bob Barton-Consultants/Local Govt, committee member
- Ron Ruettgers- Greater Bakersfield Separation of Grade District, interested party
- Tom Glover- Caltrans, Railroad Agreements Branch
- Douglas Mays-Consultant

**Revised Formula For Crossing Nominated For Separation Or Elimination**

$$P = \frac{V (T + 0.1 \times LRT) (AH + 1)}{C} + SCF$$

**<u>Cost Factor</u> – C = Cost Allocated by Grade Separation Fund**
The state allocation or the partial amount needed to fund the project by each nominating party should be used for the cost factor.

| | |
|---|---|
| Bob Barton | • expressed strong opposition, urging that the cost factor should remain as is, to maintain the integrity of the priority formula, and to be consistent with the formulae used consistently for the past four decades.<br>• outlying and rural areas grade separations can still be built for $4 to $7 million … there is no way the smaller and less affluent local agencies, which are usually totally dependent on State allocations up to $5 million, could compete. |

| | |
|---|---|
| | • using a partial amount may be inconsistent with and in violation with the description of a "project" as defined in the Section 2450 of the Streets and Highways Code |
| Ronald F. Ruettgers | Should be left alone as in the current formula, removing or reducing the cost factor artificially would lose the benefit feature of a lower cost project. |
| Tom Glover | The only specific comment I have on the revised formula is to make sure it is clear that if a nominated project intends to request multi-year funding under Section 2454(h), then the entire amount of proposed State funding (up to $20,000,000) should be used in computing the Priority index |
| Douglas Mays | Urge the Commission to leave the actual project cost in the Priority List Formula because it is a means to fairly equate the train and traffic volume benefits to the actual costs to build. To do otherwise, as proposed, reduces the Priority List Formula to a measure of traffic volumes only, and unfairly penalizes smaller communities with lower traffic volumes and lower cost projects. |

**Blocking Delay – BD = Blocking Delay Per Train**
BD should be placed in the formula as an additive in the Special Conditions Factor with the computation as the total 24-hour delay.

| | |
|---|---|
| Bob Barton | Believe BD should be a multiplier to reflect the greater severity of and adverse impact on communities when delays can average 3 to 5 minutes, vs: communities where commuter trains cause delays averaging only 45+ seconds. |
| Ronald F. Ruettgers | Agree that the computation should be an additive with a total 24 hour delay. |
| Douglas Mays | Leave as a multiplier to the Formula provides a direct measure of the quantitative impact resulting from train traffic and train movements |

**Accident History – AH = Accident History** (last 10 years from application filing due date)
Retain the current method of the AH calculation in the index formula as a multiplier.

| | |
|---|---|
| Bob Barton | Continue to be calculated as in the past, (but if AH=0 then AH should) be used as an additive factor, and if still considered inadequate, then multiplied by 2 <changed to AH+1 to eliminate zero effect if no current AH). |
| Ronald F. Ruettgers | Should also be additive in the SCF, to take one factor out of the multiplier (BD) and leave the other (AH) would seem to artificially skew the VxT/C part of the formula. |
| Tom Glover | Continued as a multiplier. |
| Douglas Mays | Include the accident history as an additive factor … and not a multiplier. The accident history additive factor should carry significant weight in the Formula. |

**Special Conditions Factor - SCF = VS+RS+CG+PT+OF+BD**

Increase the points from three points to five points awarded to community impact and eliminate some of the special conditions factors such as secondary accidents, emergency vehicle usage and alternate route (AR) availability. Secondary accidents and alternate route (AR) availability were vague and difficult information to gather. The community impact already accounts for the emergency vehicle usage. The other factor (OF) was reduced from 18 points to 14 points by eliminating secondary accidents (-3 points) and emergency vehicle usage (-3 points) then increasing community impact (+2 points). With the elimination of AR (-5 points) plus the addition of BD (+5 points), the total for SCF is reduced from a maximum possible of 62 points to 58 points.

| | |
|---|---|
| Bob Barton | Agreed info difficult to gather. |
| Ronald F. Ruettgers | Recommend that AH and BD be included in the SCF with extra points for accidents. This scenario should be reviewed or modified as necessary such to limit the total SCF points. |

**Light-Rail**

Leave the 0.1 light-rail train volume multiplier as it is.

| | |
|---|---|
| Bob Barton | Distributed copies of suggested legislation which would create two separate funds, each $60 million --- one for conventional separations, and one for crossings where the predominant traffic is light rail. |
| Ronald F. Ruettgers | Would acquiesce to leaving the 0.1 LRT multiplier. |

**Formula for Existing Separations**

Leave the formula for existing separations as is.

No additional comments.